

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Washington, DC

NOTICE OF RELEASE OF USVL-230, A Novel Watermelon Breeding Line

The Agricultural Research Service of the United States Department of Agriculture announces the release of a novel watermelon breeding line USVL-230. This breeding line contains the nuclear genome of watermelon (*Citrullus lanatus* var. *lanatus*) and a chloroplast and mitochondrial genomic background derived from the desert species *C. colocynthis*.

Development of USVL-230 was initiated in 1999 with the greenhouse observations of F1 plants derived from reciprocal crosses between the U.S. Plant Introduction (PI) 386015 (*C. colocynthis*) and the watermelon cultivars (New Hampshire Midget, Allsweet, and Charleston Gray). In general, F1 plants derived from a cross where the *C. colocynthis* PI 386015 was the maternal parent and produced a female flower for every 2-3 male flowers. Conversely, in the reciprocal cross where a watermelon cultivar was used as the maternal parent, the F1 plants produced a female flower for every 4-6 male flowers. As with most plant species, the chloroplast and mitochondria are inherited maternally in watermelon, and it is possible here that, in addition to nuclear genes, a maternally inherited gene(s) could influence female flower production. The species *C. colocynthis* thrives in the hot deserts of North Africa, the Middle East, and South and Central Asia. As a desert plant, *C. colocynthis* can tolerate drought, intense sun exposure, and high day and low night temperatures better than the cultivated watermelon. Our main objective was to enhance genetic diversity in American watermelon cultivars, known to share a narrow genetic base, by replacing their chloroplast and mitochondrial genomes with those of *C. colocynthis*.

The effort to develop USVL-230 was initiated by first crossing an F1 hybrid ['New Hampshire Midget' x Griffin 14113 (*C. lanatus* var. *citroides*)] to *C. colocynthis* PI 386015 (used as the maternal parent) to produce an interspecific hybrid plant (99-67-LCO). Subsequently, a series of crosses were made using watermelon cultivars as the male (pollinator) parents. First, the 99-67-LCO plant (used as the maternal parent) was crossed with the cultivar Allsweet. The F1 plant was backcrossed to 'Allsweet' (recurrent male parent) through the BC2 generation (the BC2 seeds were designated as 01-163). A 01-163 plant (used as a maternal parent) was crossed with 'Charleston Gray' and the resulting F1 plant was backcrossed to 'Charleston Gray' (recurrent male parent), generating BC1 seed (02-195). A 02-195 plant (used as the maternal parent) was crossed with 'Extra Early Sugar Baby (EESB)'. A resulting F1 (02-195 x EESB) plant was self-pollinated, and an F2 plant with globular fruits and red firm flesh (8.5-9.0% solid soluble content) devoid of hollow heart was selected. This plant was self-pollinated and a plant producing globular fruits with qualities similar to those described for the fruits of the F2 plant was selected in six successive generations to produce F8 seeds (USVL-230).

In field trials at Charleston, S.C. (2005, 2006, 2008, and 2009), the USVL-230 plants produced 2.6-2.9 market size fruits per plant, with size range of 8.8-11.2 lb, and 8.8" long and 7.8" width. The USV-230 fruits are smaller than 'Crimson Sweet' fruits grown in the same field (1.4 fruits per plant with fruit size of 17.0-23.5 lb; 12.3" long and 10.3" width). The fruits of USVL-230 are ovular with light green dappled rind (0.7-0.8" thick) and coral red flesh, which resembles the flesh color of 'Calhoun Gray' watermelons that were grown in the same field. The USVL-230 fruits are ready for harvest in mid-season (76 days post planting). Their flesh is firm with slight crisp texture, and has 8.3-8.9% solid soluble content and acceptable flavor compared with 'Crimson Sweet' which had 10.0-12.3 soluble content. The USVL-230 fruits do not exhibit any hollow heart, and contain brown seeds (7.0 mm long and 4.0 mm width), similar in size and color to seeds of 'Charleston Gray'.

Molecular analysis (Southern hybridization) with chloroplast and mitochondrial DNA probes confirmed that USVL-230 retains the chloroplast and mitochondrial genomes derived from the *C. colocynthis* parent (PI 386015). Testing of plants from early generations (F1, BC1 and BC2) that were successively used as the maternal parents in the breeding scheme for USVL-230, confirmed that they contain increasing amounts of the nuclear genome of watermelon cultivars (*C. lanatus* var. *lanatus*) and chloroplast and mitochondrial genomes derived from *C. colocynthis* (as indicated by Levi and Thomas 2005; Genetic Resources and Crop Evolution 52:609-617). Furthermore, DNA sequencing analysis of mitochondrial genes (NAD9 and RPL5) of an F7 plant used for production of USVL-230 (F8) confirmed that its cytoplasm is derived from *C. colocynthis*.

USVL-230 might be useful for scientists and plant breeders interested in enhancing watermelon cultivars with cytoplasm (chloroplast and mitochondrial genomes) of wild watermelon species. Also, this breeding line may be used by those interested in examining the effect of the desert species *C. colocynthis* cytoplasm on photosynthesis and respiration, and possibly on yield, and on disease resistance in watermelon. In breeding programs, USVL-230 should be used as a maternal parent to retain the *C. colocynthis* cytoplasm.

Small samples of seed of USVL-230 are available for distribution to interested research personnel who make written requests to Dr. Amnon Levi, USDA, U.S. Vegetable Laboratory, 2700 Savannah Highway, Charleston, SC 29414 (email: amnon.levi@ars.usda.gov). Seed of USVL-230 will also be submitted to the National Plant Germplasm System where it will be available for research purposes, including the development and commercialization of new cultivars. It is requested that appropriate recognition of the source be given when this germplasm contributes to research or development of new breeding line or cultivar.

Signature:


Deputy Administrator, Crop Production and Protection
Agricultural Research Service, U.S. Department of Agriculture

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Date